AMENDMENTS TO CLAIMS

Complete Listing of the Claims

1. (Currently amended) An apparatus for multibeam lithography by means of electrically charged particles, comprising an illumination system having a particle source, the illumination system producing an illuminating beam of said electrically charged particles, and a multibeam optical system positioned after the illumination system as seen in the direction of the beam, said multibeam optical system comprising at least one aperture plate having an array of a plurality of apertures to form a plurality of sub-beams, wherein the multibeam optical system focuses the sub-beams onto the surfaces of a substrate, for simultaneously writing a plurality of different patterns,

wherein for each sub-beam a deflection unit is provided, said deflection unit being positioned within the multibeam optical system and adapted to ~~correct individual imaging aberrations of the respective sub-beam with respect to the desired target position and/or~~ position the sub-beam during a writing process an the substrate surface for independently wtiting a pattern which is different from patterns of other sub-beams, and

wherein for each sub-beam the respective aperture of the first of the at least one aperture plate defines the size and shape of the sub-beam cross-section and the multibeam optical system produces an image of said aperture on the substrate surface.

2. (Original) The apparatus as claimed in claim 1, comprising a particle source and a collimator optical system for producing a particle beam which is substantially homogeneous across its cross-section and a multibeam optical system positioned after the collimator optical system as seen in the direction of the beam, said multibeam optical system forming the beam into a plurality of sub-beams and focusing the sub-beams onto the surface of a substrate, wherein the multibeam optical system comprises at least one aperture plate having an array of a corresponding plurality of apertures to form said sub-beams, wherein for each sub-beam a deflection unit is provided, said deflection unit being positioned after the multibeam optical system and adapted to correct individual imaging aberrations of the respective sub-beam with respect to the desired target position and/or position the sub-beam during a writing process an the substrate surface.

3. (Original) The apparatus as claimed in claim 1, wherein the electrically charged particles are ions.

4. (Cancelled) The apparatus as claimed in claim 1, wherein or each sub-beam the respective aperture of the first aperture plate defines the size and shape of the sub-beam cross-section and the multibeam optical system produces an image of said aperture on the substrate surface.

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5. (Original) The apparatus as claimed in claim 4, wherein the multibeam optical system produces a demagnified image of said aperture on the substrate surface, the demagnification factor being at least 20:1.

6. (Original) The apparatus as claimed in claim 5, wherein the demagnification factor is a least 400:1.

7. (Original) The apparatus as claimed in claim 1, wherein the multibeam optical system is realized as an electrostatic lens column array.

8. (Original) The apparatus as claimed in claim 1, wherein for each sub-beam an electrostatic lens arrangement is provided as a means to adjust the beam diameter at the substrate surface.

9. (Original) The apparatus as claimed in claim 8, wherein the electrostatic lens arrangement is placed within the multibeam optical system.

10. (Original) The apparatus as claimed in claim 1, wherein the deflection units are electrostatic multipole electrode systems.

11. (Original) The apparatus as claimed in claim 10, wherein the electrostatic multipole electrode systems are produced by means of microfabrication methods, e.g. using semiconductor technology.

12. (Original) The apparatus as claimed in claim 1, wherein the deflection units of the sub-beams are organized in groups, the controlling of the beam positioning of the sub-beams being performed synchronously for each group.

13. (Original) The apparatus as claimed in claim 1, comprising a reference plate for alignment of the particle optical system.

14. (Original) The apparatus as claimed in claim 13, comprising an optical alignment system to adjust the position of the substrate with respect to the reference plate.

15. (Original) The apparatus as claimed in claim 1, comprising several aperture plates which are penetrated by the sub-beams, said aperture plates

having openings forming aperture lenses having a focusing effect on the sub-beams.

16. (Original) The apparatus as claimed in claim 1, wherein the deflection unit is integrated into one or more of the electrodes forming the electrostatic lens arrangement.

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17. (Original) The apparatus as claimed in claim 16, wherein the electrodes of the deflection unit are realized as sectors of at least one annular region around the apertures, the sectors being electrically insulated from each other.

18. (Original) The apparatus as claimed in claim 1, wherein the deflection unit is a traveling wave deflector means, comprising poles segmented in axial direction forming segments, the segments being connected in the axial direction by inductive and capacitive elements to transfer the electric field within the deflection unit from one segment to the next with a predetermined speed.

19. (Previously amended) A method for multibeam lithography by means of electrically charged particles using the apparatus of claim 1, wherein a particle beam is produced by a particle source, transferred into an illuminating beam and formed into a plurality of sub-beams, the sub-beams being formed by means of at least one aperture plate having an array of a corresponding plurality of apertures and the sub-beam are focused onto the surface of a substrate, wherein the beam position of each sub-beam is controlled by means of a deflection unit, for correcting individual imaging aberrations of the respective sub-beam with respect to the desired target position and/or positioning the sub-beam during a writing process the substrate surface.

20. (Original) The method of claim 19, wherein each sub-beam is adjusted with respect to its beam diameter at the substrate surface by means of an electrostatic lens arrangement.

21. (Original) The method of claim 19, wherein the deflection units of the sub-beams are controlled in groups and the sub-beams are positioned synchronously for each group.

22. (Original) The method of claim 19, wherein the particle optical system is aligned using a reference plate.

23. (Original) The method as claimed in claim 19, wherein by means of an optical alignment system, the position of the substrate is adjusted with respect to the reference plate.

24. (Original) The method of claim 19, wherein the sub-beams penetrate several aperture plates which are penetrated by the sub-beams, and are focused due to said aperture plates having openings forming aperture lenses.

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25. (Original) The method of claim 19, wherein for each sub-beam the respective aperture of the first aperture plate defines the size and shape of the sub-beam cross-section and a multibeam optical system produces an image of said aperture on the substrate surface.

26. (Original) The method as claimed in claim 25, wherein the multibeam optical system produces a demagnified image of said aperture on the substrate surface, the demagnification factor being at least 20:1.

27. (Original) The method as claimed in claim 26, wherein the demagnification factor is at least 400:1.

28. (Original) The method of claim 19, wherein the focusing of the sub-beams onto the surface of a substrate is done by means of an electrostatic lens column array.